SURFACE RUNOFF SUB-ELEMENT

CITY OF SUNNYVALE
GENERAL PLAN

JANUARY 1993

Adopted
February 23, 1993

Sunnyvale Public Works Department
Sunnyvale, California

CREDITS

CITY COUNCIL
Patricia E. Castillo, Mayor
Robin Parker, Vice Mayor
Stan J. Kawczynski; Richard Napier
Barbara Waldman; Frances Rowe
Lawrence E. Stone

PLANNING COMMISSION
David McKinney, Chair
Jack Walker; Richard Bernhardt;
Brian Cilker; John Ellison;
John Miller; James Roberts

CITY STAFF
CONTRIBUTING TO THE SUB-ELEMENT
Thomas F. Lewcock, City Manager
Ed James, Assistant City Manager
Members of the Planning and Economic Development
Review Committee

PUBLIC WORKS DEPARTMENT STAFF
CONTRIBUTING TO THE SUB-ELEMENT
Marvin A. Rose, Director
Christine Fischer, Assistant Director P.W./C.E.
Richard Bell, Civil Engineer
Helen Farnham, Environmental Operations Manager
Dan Burke, Public Works Supervisor
Susan Lester, Administrative Assistant

CONSULTANTS
EOA, Inc.
Eisenberg, Olivieri, & Associates
1410 Jackson Street
Oakland, California 94612

PREFACE

This Surface Runoff Sub-Element establishes a policy framework to minimize the discharge of pollutants to creeks and South San Francisco Bay to the maximum extent practicable and to prevent flooding. Until recently, surface runoff activities focused only on preventing flooding; however, the City of Sunnyvale must now also control the quality of surface runoff discharged to storm drains to comply with its municipal storm water National Pollution Discharge Elimination System (NPDES) permit adopted in June 1990 and amended in February 1992. This Surface Runoff Sub-Element institutionalizes the work being conducted as part of the Santa Clara Valley Nonpoint Source (SCV NPS) Control Program to reduce pollutants discharged in surface runoff and addresses flooding issues.

The Surface Runoff Sub-Element is one of the sub-elements of the Environmental Management Element of the City's General Plan. The other sub-elements of the Environmental Management Element include *Water Resources, Sanitary Sewer System, Energy, Noise and Air Quality.* The *Water Resources Sub-Element* addresses the concerns of maintaining an adequate water supply and ensuring that the quality of the City's groundwater is preserved. The *Sanitary Sewer System Sub-Element* deals with the transportation and treatment of sewage and industrial wastes. The *Energy Sub-Element* discusses energy conservation and management. The *Noise Sub-Element* protects residents from excessive noise which can cause physical and mental health problems. The *Air Quality Sub-Element* has not been prepared yet.

Information in this Surface Runoff Sub-Element was taken from City, County, and Regional Plans; technical reports such as monitoring and land subsidence studies; and manuals on planning and best management practices. A listing of all reports used in developing this Sub-Element is included in Appendix A.

This Sub-Element was developed by City staff primarily from the Public Works Department with consultant assistance.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

EXECUTIVE SUMMARY

Introduction

Storm drain systems have historically been designed to prevent or control property damage due to flooding. Recent laws and regulations require that municipalities, such as the City of Sunnyvale, minimize the discharge of pollutants to storm drain systems they own and operate to the maximum extent practicable and effectively prohibit the discharge of non-storm water to municipal storm drains. Thus, municipalities are now required to control the quantity and quality of surface runoff. As a member of the Santa Clara Valley NonPoint Source (SCV NPS) Control Program, the City of Sunnyvale works jointly with all municipalities in Santa Clara Valley and the Santa Clara Valley Water District (SCVWD) to control the discharge of pollutants in surface runoff.

Purpose

The Surface Runoff Sub-Element establishes integrated goals, policies and actions designed to minimize the discharge of pollutants to creeks and South San Francisco Bay to the maximum extent practicable. In addition this Sub-Element describes a strategy to prevent flooding due to storm flows and addresses possible rise in sea levels due to global warming. Information, guidance and a policy framework are provided for achieving these goals.

Major Findings

The following major findings are derived from information presented within the Surface Runoff Sub-Element. These findings form the basis of the goals and policies which follow.

Fundamentals of Hydrology and Surface Runoff Control

1. Average annual rainfall in the City ranges from 12 - 16 inches a year. Rainfall primarily occurs between October and April.

2. Increased imperviousness associated with urban development results in increased runoff volume and peak rate during storms, reduced infiltration, and greater runoff velocity.

3. The City's storm drainage system was installed to collect and transport surface runoff to prevent flooding.

4. Some activities in urban areas release pollutants which may ultimately discharge to watercourses.

5. Best management practices (BMPs) are implemented to help offset the impacts of urbanization on the quality of surface runoff.

Collection, Transportation and Discharge of Surface Runoff

1. The Master Plan for the storm water drainage system (1958, revised 1967) developed an economical drainage system which protects property and the safety of residents.

2. All storm drain inlets are inspected and most are cleaned prior to the start of the rainy season. Approximately one-tenth of the inlets require cleaning during the rainy season due to flooding complaints.

3. The San Francisco Bay Regional Water Quality Control Board (Regional Board) Basin Plan requires that the discharge of storm water to the subsurface through shallow drainage wells be regulated to protect the beneficial uses of groundwater.

4. Regional Board amended the City's areawide municipal storm water NPDES permit (Order No. 92-021) in February 1992 to require an infiltration policy which would provide technical guidance on appropriate sites and design of infiltration-based control measures.

Ground Subsidence and Rise in Sea Level

1. Ground subsidence totaled approximately 6 - 8 feet throughout the City during the period from 1934 to 1967; and has been substantially reduced due to the availability of imported surface water and decreased groundwater pumping.

2. Although groundwater levels have recovered, due to drought conditions since the late 1980's, the Santa Clara Valley Water District has resumed ground subsidence monitoring.

3. Rates of sea level rise have doubled in the last 20 years possibly due to the greenhouse effect (emission of gases which increase the earth's air temperature). If this rate continues, the sea level will rise 4.32 inches in the next 50 years.

4. Future sea level rises should be considered when designing structures along shorelines.

Erosion and Sedimentation Control

1. The City is mostly flat and approximately 97% built out.

2. If there is potential during construction for erosion and sedimentation, the Department of Public Works advises construction site engineers to incorporate guidelines from the Association of Bay Area Government's (ABAG) Manual of Standards for Erosion & Sediment Control Measures into project plans. BMPs developed by the SCV NPS Control Program will also be required as part of the plans and daily construction activities.

3. The City of Sunnyvale has incorporated into its Municipal Code the Uniform Building Code including Chapter 70 which describes measures to regulate grading, filling, and excavation.

4. The City of Sunnyvale complies with requirements for erosion and sedimentation control outlined in the EPA's November 1990 storm water regulations.

Pollution from Non-point Sources

1. Since monitoring of surface runoff samples was initiated in 1988, total copper, lead, and zinc concentrations in the City of Sunnyvale exceeded water quality objectives for the protection of freshwater aquatic life in more than half of the samples.

2. The City is implementing pollution prevention controls which focus on industrial activities, illegal dumping incidents and illicit connections, pollutants from automobiles, public awareness, and new development and construction areas.

Funding

A funding source or fee system may need to be established to provide resources to support pollution prevention activities. This may be done with the Sanitary Sewer Revenue structure because many of the required activities are being implemented by the Water Pollution Control Plant (WPCP) personnel. Currently the City spends approximately $250,000 annually to control discharges of pollutants into the municipal storm drain system.

Goals and Policies

Protect Beneficial Uses of Creeks and San Francisco Bay

A. Assure the reasonable protection of beneficial uses of creeks and San Francisco Bay, established in the Regional Board's Basin Plan, and protect environmentally sensitive areas.

A.1. Continue to support the identification and development of BMPs suitable for use in the City through participation in the SCV NPS Control Program, American Public Works Association's Stormwater Quality Task Force, the Bay Area Stormwater Management Agencies Association, and similar organizations.

A.2. Comply with regulatory requirements and participate in processes which may result in modifications to regulatory requirements.

A.3. Ensure that BMPs are implemented to reduce the discharge of pollutants in storm water to the maximum extent practicable.

A.4. Effectively prohibit illicit discharges and improper disposal into the storm drain system.

A.5. Prevent accelerated soil erosion.

Maintain Storm Drain System to Prevent Flooding

B. Maintain storm drain system.

B.1. Maintain and operate the storm drain system so that storm waters are drained from 95 % of the streets within one hour after a storm stops.

B.2. Respond to storm drain emergencies.

C. Ensure that flood hazards are recognized.

C.1. Operate and maintain the storm drainage system at a level to minimize damages and ensure public safety.

C.2. Prevent flooding to protect life and property.

C.3. Monitor and plan for hydraulic changes due to global warming, earthquakes and/or subsidence.

Minimize Pollutants and Runoff from New Developments

E. Minimize the quantity of runoff and discharge of pollutants to the maximum extent practicable by integrating surface runoff controls into new development and redevelopment land use decisions.

E.1. Consider the impacts on the water quality of surface runoff as part of land use and development decisions and implement BMPs to minimize the total volume and rate of runoff.

E.2. Consider the ability of a land parcel to detain excess storm water runoff in flood prone areas and require incorporation of appropriate controls.

Funding

F. Consider alternative methods of generating revenue to support the surface runoff quality improvement activities.

F.1. Consider developing a revenue program that will ensure funding to:

- implement BMPs;

- conduct public information and participation outreach activities;

- inspect and eliminate illicit discharges and to inspect industrial and commercial facilities;

- meet storm drain operational and maintenance needs to improve surface runoff quality;

- monitor storm water quality;

- participate in general SCV NPS Control Program activities; and

- provide appropriate reserves.

COMMUNITY CONDITIONS

Background of Regulatory Requirements

Federal Surface Runoff Requirements

In 1972, Congress adopted a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" commonly referred to as the Clean Water Act. The Clean Water Act stressed the need to control, treat, and eliminate all pollutant sources in order to protect the uses of the nation's waters. Since little data was available regarding the pollutants in surface runoff, the Clean Water Act mandated that runoff, its constituent pollutants, and the effects of its pollutants on water quality be further studied.

The Clean Water Act was amended in 1987 by the Water Quality Act. Section 402(p) of the Water Quality Act states that except for National Pollutant Discharge Elimination System (NPDES) permitted discharges, only storm water is allowed to discharge into municipal storm drainage conveyance systems (non-stormwater discharges are prohibited). In addition, Section 402(p) requires controls on storm water "to reduce the discharge of pollutants to the maximum extent practicable."

Section 304(l) of the 1987 Water Quality Act required the Environmental Protection Agency (EPA) and the States to develop lists of impaired waters and sources of pollutants. In 1989, The California State Water Resources Control Board (State Water Board) placed South San Francisco Bay, south of the Dumbarton Bridge (Lower South Bay), on this list for the following pollutants: cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc. Identified sources included the three South Bay Publicly Owned Treatment Works (San Jose, Sunnyvale and Palo Alto) and "storm drains."

Section 304(l) of the 1987 Water Quality Act also requires that States prepare "individual control strategies" (ICS) to control toxic pollutant discharges for waters on the list. The EPA

promulgated regulations in June 1989 that interpret an ICS to mean "a final NPDES permit with supporting documentation showing that effluent limits are consistent with an approved waste load allocation or other documentation which shows that the applicable water quality standards will be met not later than three years after an individual control strategy is established." The EPA regulations state that the ICS or NPDES permit must reduce toxic pollutant discharges from identified sources "in combination with existing controls on point and nonpoint sources of pollutants." (Point source pollutants originate from a discrete point such as a pipeline while nonpoint source pollutants originate from diffuse sources over a wide area.)

The EPA promulgated NPDES permit application regulations for storm water discharges on November 16, 1990. The November 1990 storm water regulations require that an NPDES permit be obtained by municipalities with separate municipal storm drain systems that: 1) serve a population of 100,000 or more; 2) discharge stormwater which contributes to a violation of a water quality standard; or 3) contributes significant pollutants to waters of the United States. In addition, storm water discharges associated with industrial or construction activities are also required to obtain NPDES permit coverage for storm water discharges separate from the municipal storm water NPDES permit.

State and Regional Surface Runoff Requirements

The City of Sunnyvale along with the County of Santa Clara, the SCVWD and other cities in Santa Clara Valley which discharge to the Lower South Bay joined together to form the SCV NPS control Program in 1986 to comply with federal storm water requirements and proposed requirements in the San Francisco Bay Regional Water Quality Control Board's (Regional Board) amended Water Quality Control Plan for the San Francisco Bay Region (Basin Plan). The City of Sunnyvale was instrumental in encouraging the SCVWD to play a leadership role in coordinating Program activities since the SCVWD owns and operates the major storm drain channels, and in forming an initial Task Force to develop a work plan. The City also recommended to the Regional Board that a high priority be placed on implementing an

aggressive nonpoint source control and monitoring program rather than impose stricter requirements on the three South Bay Publicly-Owned Treatment Works (Sunnyvale, Palo alto, and San Jose/Santa Clara) to control mass loadings to the South Bay. The Regional Board accepted the City's recommendations and incorporated modifications into the amended Basin Plan.

The Regional Board's Basin Plan, amended in December 1986, set forth requirements for a program to characterize and control nonpoint source discharges entering the Lower South Bay and its tributaries through the storm drain system by September 1987. Although other areas in the San Francisco Bay Region were also required to implement nonpoint source control programs, the South Bay (below the Dumbarton Bridge) was the Regional Board's first priority due to the environmental sensitivity of the area. In February 1989, the Lower South Bay was included in the list of impaired waters in the State of California.

An NPDES permit (Regional Board Order No. 90-094) for storm water was adopted by the Regional Board for the SCV NPS Control Program in June 1990. Several months later, the EPA approved the NPDES permit an Individual Control Strategy to control toxic pollutants discharged in surface runoff. The 1990 NPDES permit requires the SCV NPS Program to plan and implement the following programs: eliminate illicit connections and illegal dumping; stormwater management (including maintaining existing programs and implementing educational, regulatory, and public agency control measures); identify and control runoff from industrial dischargers' facilities; field testing of selected stormwater pollutant control measures; source control; toxicity control; characterization of urban transportation corridors; monitoring; and reporting.

In addition to other reports prepared previously to comply with the NPDES permit, the SCV NPS Program prepared a comprehensive Storm Water Management Plan (Plan) for submittal to the Regional Board in January 1991. The Plan describes control measures to be implemented to comply with the NPDES permit. Components of the Plan include: controls for new construction and development, public information and participation tasks, illicit connection and illegal dumping

elimination, industrial inspections, maintenance activities, monitoring and storm water treatment. An addendum to the Plan was submitted to the Regional Board in February 1991 which specifically described activities that each municipality and the SCV NPS Control Program will perform to implement the Plan.

In July 1990, the State Water Resources Control Board (State Board) received a petition from Citizens for a Better Environment, Save San Francisco Bay Association and Santa Clara Valley Audubon Society (petitioners) to review Regional Board Order No. 90-094. The major reason the petitioners contested the Regional Board's Order was because it did not include numeric, water quality-based effluent limitations for storm water discharges to the Lower South Bay. In response to this petition the State Board issued Order No. 91-03 in May 1991 which stated that "the intermittent, irregular discharge of storm water...make it exceedingly difficult to formulate an appropriate numeric effluent limitation which would bear a reasonable relationship to established ambient water quality standards and criteria... At least at this preliminary point in the regulatory program for storm water discharges, it appears that a approach which implements "best management practices" to reduce sources and control pollutants is desirable."

In February 1992 the Regional Board amended Regional Board Order No. 90-094 (Regional Board Order No. 92-021). The amended NPDES permit incorporates additional requirements for transportation control measures, internal audits, and an infiltration policy. In addition, annual fiscal year progress reports are required to be submitted to the Regional Board by September 1 of each year.

TABLE 1

EXISTING AND POTENTIAL BENEFICIAL USES OF THE SOUTH BAY AND CREEKS IN THE CITY OF SUNNYVALE

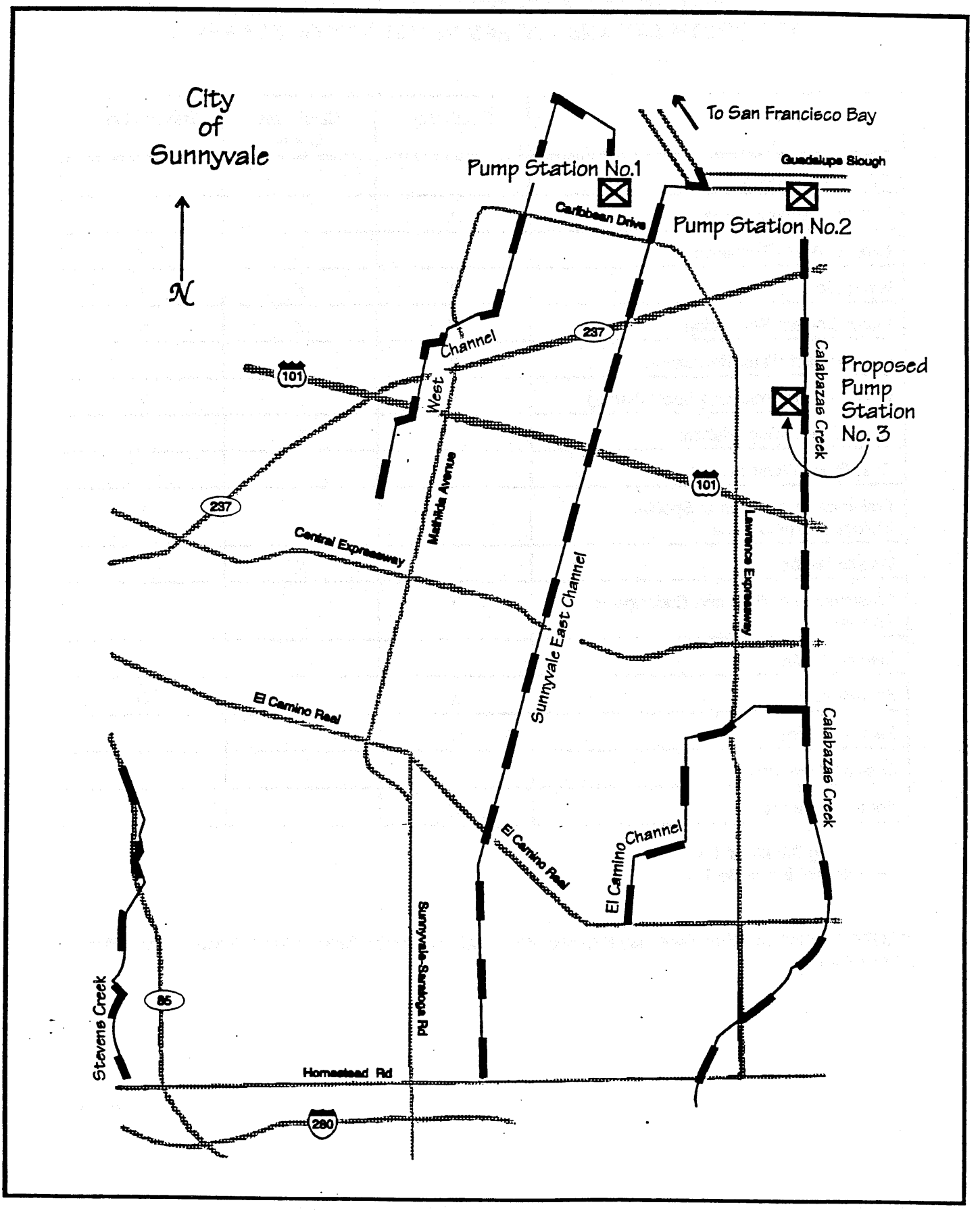
Beneficial Uses	South Bay	Calabazas Creek	Stevens Creek
Agricultural Supply		X	
Industrial Service Supply	X		
Ground Water Recharge		X	X
Navigation	X	X	X
Water Contact Recreation	X	X	X
Non-Contact Water Recreation	X	X	
Ocean Commercial and Sport Fishing	X		X
Warm Fresh Water Habitat		X	X
Cold Fresh Water Habitat		X	
Preservation of Areas of Special Biological Significance			X
Wildlife Habitat	X	X	
Preservation of Rare and Endangered Species	X		
Marine Habitat			X
Fish Migration	X		O
Fish Spawning	O		
Shellfish Harvesting	X		
Estuarine Habitat	X		

X = Existing Beneficial Use
O = Potential Beneficial Use

SOURCE: 1992 San Francisco Bay Regional Water Quality Control Board Water Quality Control Plan (Basin Plan).

FIGURE 1

CITY OF SUNNYVALE WATERCOURSES AND PUMP STATIONS



Fundamentals of Hydrology and Surface Runoff Controls

The City of Sunnyvale's climate is warm and dry. Average annual rainfall ranges from 12 to 16 inches and primarily occurs during winter months. Rainfall drains to Stevens Creek in the southwest portion of the City, Calabazas Creek in the east, and to three constructed channels in the interior of the city. Drainage structures in the city have minimized flooding and property damage; however, rainfall runoff from urban areas may degrade the quality of watercourses.

This section describes the effects of urbanization on storm water quality, briefly summarizes the City's existing storm drainage system, and describes possible modifications to the City's storm drainage system to improve water quality including storm water pollutant control measures or BMPs currently being implemented in coordination with the SCV NPS Control Program.

Fundamentals of Hydrology

Prior to urbanization, rainfall would naturally drain to Stevens Creek and Calabazas Creek. The increase in ground imperviousness associated with urban development results in increased runoff volume and peak rate during storms, reduced infiltration, and greater runoff velocity which may increase erosion and sedimentation.

Prior to development, rainfall infiltrates permeable surfaces and a relatively small amount discharges directly to streams as surface runoff. After development and paving of surfaces, more rainfall discharges directly to streams as surface runoff and less infiltrates to groundwater. This leads to greater initial stream flow, higher and more rapid peak discharge, and decreased base (groundwater) flow to streams during dry weather. To decrease the potential for flooding and property damage as a result of urban development, the SCVWD installed the Sunnyvale East and West Channels and the El Camino Channel (Figure 1). .

Urbanization leads to the release of pollutants through vehicle usage, chemical leaks and spills, litter, construction and industrial activities, and the application of pesticides and

fertilizers which may ultimately discharge to watercourses. In addition, air emissions contribute pollutants during dry periods as well as wet periods. Sources of pollutants discharged in urban runoff are discussed in more detail in the Pollution from Non-Point Sources section.

Existing Storm Drainage System

The City of Sunnyvale owns and operates approximately 3,200 storm drain inlets, two pump stations, and 145 to 150 miles of storm drains as of 1991. The SCVWD owns and operates all channels and creeks in the City: Stevens Creek, Calabazas Creek, the Sunnyvale East and West channels, and El Camino channel (Figure 1).

Two pump stations collect runoff from low lying urban areas and discharge to creeks and sloughs which are at a higher elevation. Levees were constructed in the northern portion of the city to control flooding and salt water intrusion from San Francisco Bay.

Santa Clara Valley Water District (SCVWD)

As stated above, the SCVWD owns and operates watercourses in the City. The main functions of the SCVWD are to manage water supplies, and build and maintain flood control facilities for all of Santa Clara County. In addition, the SCVWD administers the SCV NPS Control Program (for municipalities that are tributary to San Francisco Bay) which entails chairing Management Committee meetings, overseeing consultants, managing financial resources for tasks which benefit the Program as a whole, and promoting and representing the Program to public and private entities.

Regarding water supply, the SCVWD manages groundwater supplies and reservoirs, and operates three water treatment plants for distribution by water retailers. Funding is provided primarily through groundwater pumping and treated water charges. For flood control purposes, the SCVWD is divided into five zones and funding is provided through property taxes, state and federal monies, and benefit assessments levied on private property.

In addition to SCVWD staff, the SCVWD consists of a seven-member board of directors and advisory committees. Advisory committees consist of agricultural and flood control committees (one committee for each of the five flood control zones) as well as a 25-member commission.

Plan for Improvement

The following describes various BMPs being implemented by the SCV NPS Control Program as well as other BMPs which may improve storm water quality. There are many factors to consider when evaluating BMPs, one of the most important being average annual rainfall. (Note that most published guidance material on BMPs originated in areas where average annual rainfall exceeds the average annual rainfall in the City of Sunnyvale by three to four times, and thus BMPs may or may not be applicable). Other factors to consider when evaluating BMPs include: drainage area size and land use, cost-effectiveness, ease of implementation, and specific site characteristics such as soil type, depth to groundwater, slope, and space limitations. Since the City of Sunnyvale is 97% built-out, future modifications to the storm drainage system will consist primarily of retrofitting existing structures.

Pollution Prevention or Source Control

The most effective way of controlling potential pollutants to storm water is to identify land-based activities which generate pollutants and *prevent* the discharge of pollutants at its source. The following describes existing and potential source control measures.

BMPs Being Implemented by the SCV NPS Control Program. In coordination with the SCV NPS Control Program, the City is extensively involved with storm water pollution prevention activities including education of the public, labeling storm drain inlets, identification and elimination of illicit discharges, and erosion and sedimentation control. These measures will continue to be implemented and their effectiveness evaluated annually as required by the San Francisco Bay Regional Water Quality Control Board (Regional Board), the regulatory agency overseeing the SCV NPS Control Program.

Stream/Channel/Ditch Land Buffers. The presence of vegetative land buffers adjacent to watercourses (instead of paved surfaces) minimizes the discharge of pollutants to watercourses. In addition to reducing the direct discharge of pollutants, vegetative buffers may stabilize stream banks and add to the riparian habitat.

Maintenance Activities. Routine maintenance activities are usually performed for purposes other than removing pollutants. For example, street sweeping and litter removal improve aesthetics, and cleaning the storm drain system prevents flooding. However, BMPs may be employed to maximize the removal of pollutants during routine maintenance activities.

Structural Controls

Structural controls *reduce* the amount of pollutants in runoff before discharge to watercourses. Note that most structural controls may remove sediment and associated adsorbed pollutants (such as metals which may adhere to the surface of sediments), but not dissolved constituents. Structural controls may also be used in tandem with each other to enhance pollutant removal.

The following briefly describes structural controls that may or may not be appropriate for particular projects in Sunnyvale. Appendix B includes more detailed information on structural controls.

Extended Detention Pond. Dry extended detention ponds detain storm water and allows pollutants to settle out of the water column. A moderate to high level of removal can be achieved for particulate pollutants that settle easily. However, removal rates for soluble pollutants are low.

Wet Pond. Wet ponds retain storm water and have a permanent pool. Wet ponds are capable of removing particulates and soluble pollutants through settling and removal by plants, respectively.

Infiltration Controls (trenches, basins, and porous pavement). Infiltration controls filter runoff through the soil layer where a

number of physical, chemical and biological removal processes occur. If storm water contains coarse sediment, it would need to be pretreated to prevent clogging of infiltration structures.

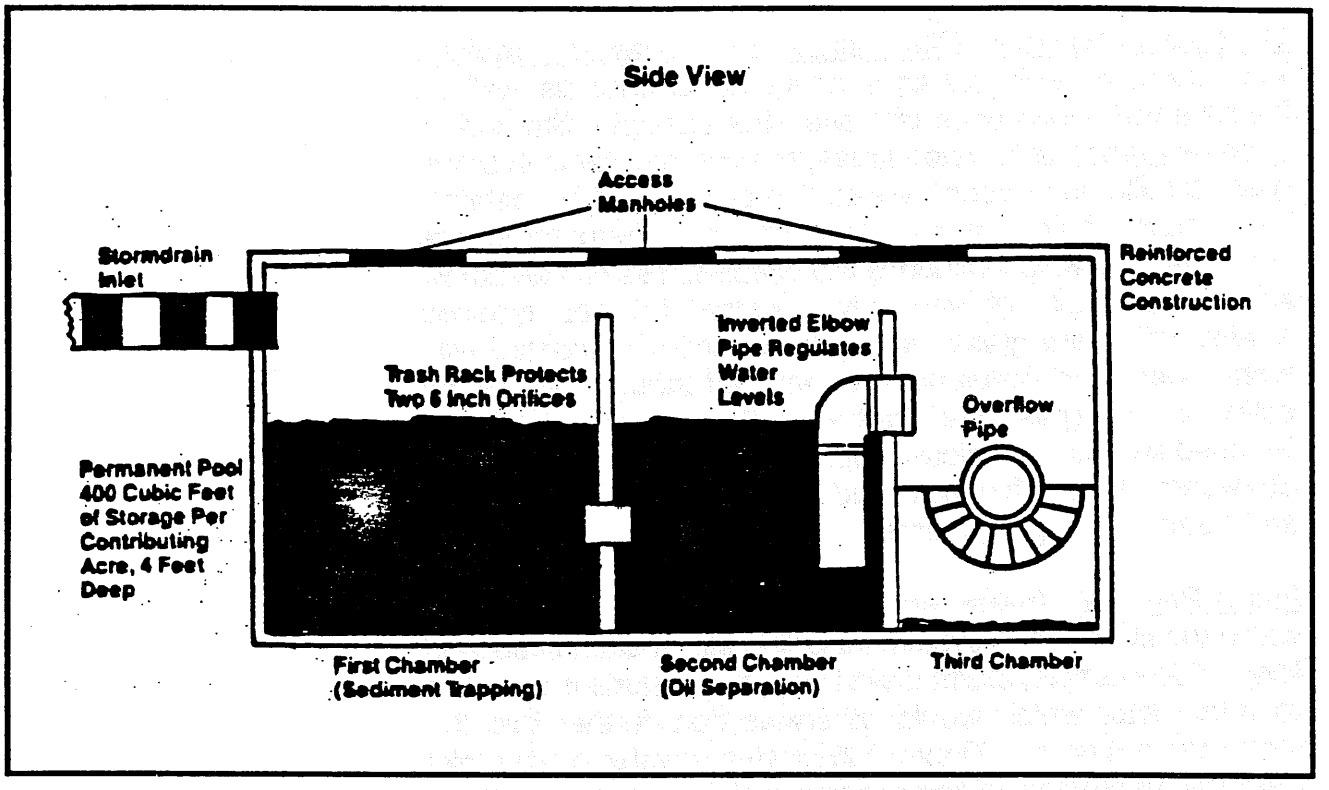
Vegetative controls (filter strips and grassed swales). Vegetative controls enhance pollutant removal as well as improve the appearance of a site. For example, filter strips, such as grassy or forested areas, remove pollutants in storm water by filtration through vegetation or soil, and/or settling. The length of filter strips, slope and soil permeability are critical factors which influence the effectiveness of filter strips. Another example of vegetative control includes grassed swales which are grassy areas where soil is inundated with storm water and pollutants are removed though the filtering action of the grass and infiltration through the soil layer. Grassed swales are typically applied in single family residential developments and highway medians as an alternative to curb and gutter drainage systems.

In-line Removal. In-line removal provides treatment capacity within the storm drain system including storm drain inlets and lines. For example, storm drain inlets may include a chamber to retain litter which would otherwise flow further into the storm drain system. Figure 2 illustrates a water quality inlet designed to remove sediment and petroleum products. Water quality inlets typically serve parking lots one acre or less in size and are particularly appropriate for sites that are expected to receive a great deal of vehicular traffic or petroleum inputs (e.g., gas stations, roads, and loading areas). These inlets must be cleaned more frequently than typical curb inlets to ensure proper inlet function. Another example of in-line treatment includes storm drain lines which are slotted or perforated to allow storm water to leach into underlying soils. If soils beneath the storm drain lines are composed of clay or other relatively impermeable material, the underlying soil may need to be replaced with more permeable soil to allow storm water to flow into the soil.

Off-line Retrofit. Off-line retrofit involves diverting the first flush of runoff from the first storm after long dry periods for treatment. The runoff may be diverted using a flow splitter. The diverted water would be allowed to flow to a lower open area so that pumping would not be needed.

FIGURE 2

SCHEMATIC OF A WATER QUALITY INLET, THREE CHAMBER DESIGN



Source: Schueler, 1987.

Collection, Transportation, and Discharge of Surface Runoff

The original Master Plan for the future development of the storm drain system in the City of Sunnyvale was prepared in 1958. The goal of the Master Plan was to develop a storm water drainage system that will handle surface runoff in every section of the City without excessive damage to either land owners or City property. The Master Plan was revised in 1967. Some modifications to the original Master Plan were required due to changes in zoning and street systems. It was found, however, that the original Plan was adequate for the design of the storm drain system. The Master Plan identifies specific drainage areas (Revised Storm Drain Master Plan, 1967) that would only be required as each area is developed. In general, the capacity of the City's existing storm drain system and maintenance program is adequate to prevent flooding.

Collection of Surface Runoff

Collection

Surface runoff from paved areas enters the storm drain system through storm drain inlets. Most of the 3,200 storm drain inlets in Sunnyvale are designed to drain directly to conveyance systems.

Maintenance

Storm drain inlets are routinely inspected prior to the rainy season each year and cleaned, if necessary, to prevent flooding, alleviate odors, and/or prevent mosquitos from breeding. Maintenance crews will also clean inlets in response to citizen complaints. The majority of the inlets are shallow (less than three feet deep) and debris is removed manually. Deeper inlets are cleaned using a vacuum truck and flushed with water to eliminate remaining debris.

If the amount of surface runoff from a drainage area exceeds the storm drain's capacity, flooding may occur. Thus it is important to maintain the storm drain system. Areas subject

to inundation of approximately one foot during a 100 year flood are illustrated in Figure 3.

In 1958, during the time of the original Storm Drain Master Plan's design, a lack of natural outlets for surface runoff resulted in several cross connections to the sanitary sewers from both storm drains lines and inlets. It was intended that when outlets, such as the Sunnyvale East and West Channels, were constructed, these cross connections would be eliminated. A memo (January 1968) from the Director of Public Works identifies known cross connections between sanitary sewers and storm drains. These cross connections, as well as any additional cross-connections that have been discovered since the memo was written have been removed. Continued maintenance practices will also help prevent pollutants from entering the storm drain system.

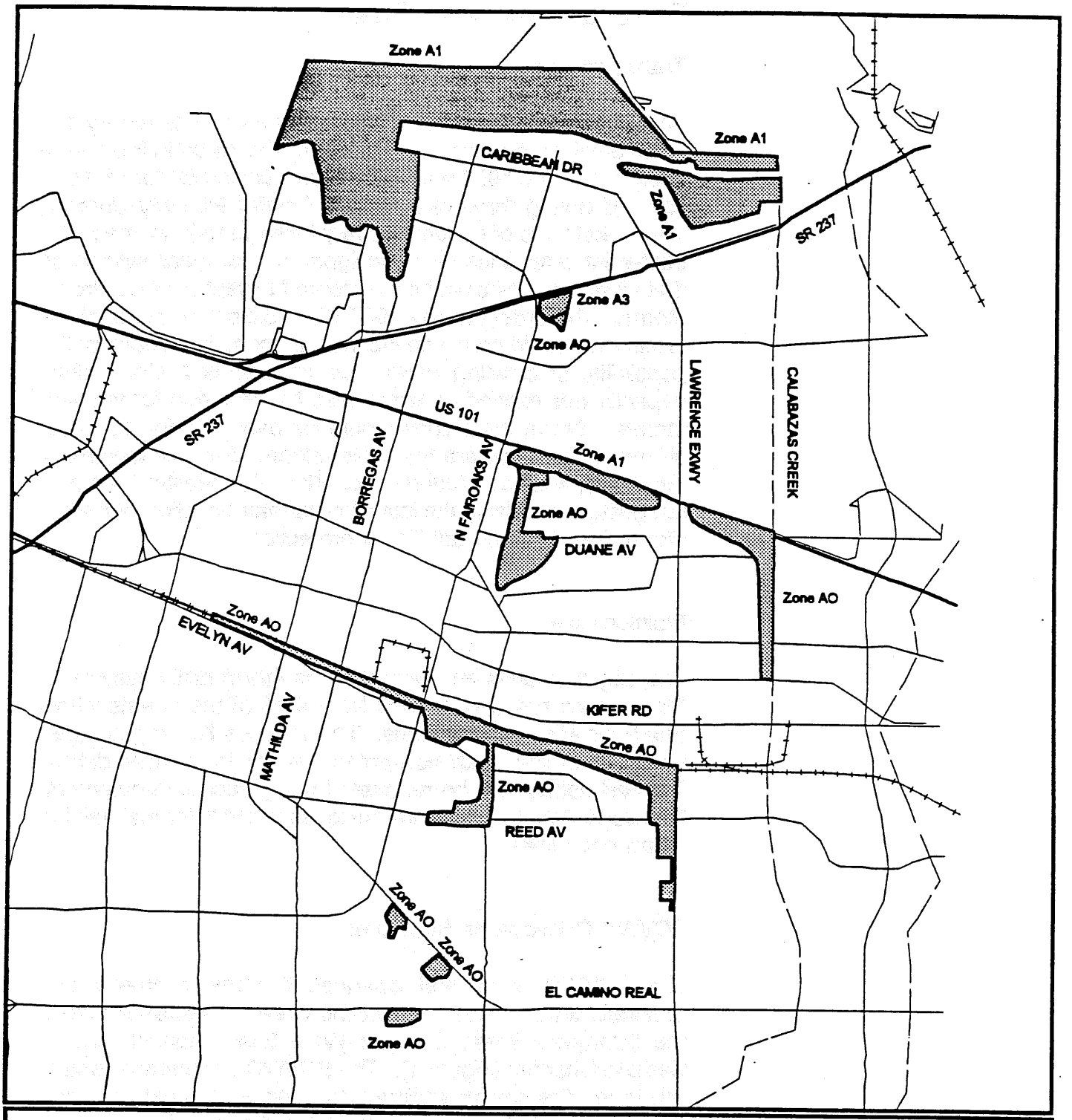
Regulatory Requirements

EPA Storm Water regulations, promulgated in 1990, require municipalities to effectively prohibit non-storm water discharges to storm drains and conveyance systems that they own and operate. For example, when designing storm drain systems, consider locating storm drains inlets in highly visible areas to discourage the potential for illegal dumping incidents. Installing storm drain inlets in grassy or other permeable areas where pollutants may infiltrate rather than discharge directly into the inlet (provided this is consistent with the SCV NPS Control Program's infiltration policy as discussed in the next section) should also be considered.

During construction or other activities which may generate pollutants which can potentially discharge to storm drains, storm drain inlets should be protected with a cover. Depending on the type of pollutants potentially discharged, the cover could either be impermeable such that nothing can enter the storm drain, or semi-permeable so that sediment and litter are filtered out.

FIGURE 3

CITY OF SUNNYVALE POTENTIAL FLOOD AREAS



Zones AO: Areas of 100-year shallow flooding with depth from one to three feet.

Zones A1,A3: Areas of 100-year flood (depth of flooding not specified); base flood elevation and flood hazard factor determined

Zone B: All unshaded area. Areas between limits of 100-year and 500-year flood; or area of 100-year shallow flooding with depth less than one foot.

Note: Zones obtained from City of Sunnyvale Department of Public Works map, "Flood Insurance Rate Map," dated 1983, as updated in 1990.

w:\graphics\c\mapinfo\sunnyvfsu20

Transportation of Surface Runoff

Transportation

The City of Sunnyvale owns and operates approximately 140 miles of storm drain lines as of 1991. Storm drain lines were designed in the 1958 and 1967 Storm Drain Master Plans to flow full during three-year storms (rainfall intensity/duration with a likelihood of occurring every three years). Some major east-west drain lines were designed for ten year storms so that all storm waters will be intercepted except during extreme storms. According to the 1967 Plan, critical areas, such as areas that would cause an inconvenience to the public or the possibility of creating dangerous conditions if storm drain capacity was exceeded, would also be designed for ten year storms. Storm drain lines would be designed for 100 year storms in areas where the street slopes downhill towards a dead end, such as a cul-de-sac. The 1967 Master Plan also suggested oversizing the last (downstream) section of certain storm drain lines for additional protection.

Maintenance

The City maintains and operates the storm drain system so that surface runoff is drained from 95% of the streets within one hour after a storm stops. This involves flushing clogged storm drain lines with non-potable water to remove debris. Flushed debris may be recovered using vacuum equipment. The Department of Public Works is responsible for maintaining storm drain lines.

SCVWD Conveyance Structures

The SCVWD owns and operates five major creeks and channels within the City: Stevens Creek, Calabazas Creek, the Sunnyvale West, the Sunnyvale East Channel, and El Camino Channel (Figure 1). The SCVWD conducts a regular program of removing sediment to maintain the capacity and flow characteristics of these creeks and channels.

City of Sunnyvale Conveyance Structures

The topography in the City of Sunnyvale generally has a northeast slope with elevations varying from sea level to about 290 feet. Much of the area is relatively flat, particularly along the City's northern perimeter which borders the Bay. According to the original Storm Drain Master Plan, a minimum safe land surface elevation of 17 feet is the City's northern limit for residential development, but provided that the minimum safe elevation could be lowered through the installation of pump stations. The minimum safe land surface elevation was later lowered to 9 feet and subsequently reduced to a level subject to the capability of storm drains to prevent flooding higher then the sidewalk area.

The City presently owns, operates and maintains two storm drain pump stations. These pump stations collect runoff from low lying areas and discharge to creeks and sloughs which are at a higher elevation. Levees were constructed in the northern portion of the city to control flooding and salt water intrusion from San Francisco Bay.

Pump Station No. 1. Water from Moffett Industrial Park drains through low level channels and pipes into a small channel and lagoon connecting to Pump Station No. 1. The lagoon is designed so that storm water is detained prior to being pumped to Guadalupe Slough. Since storm water is stored prior to discharge, this pump station is characterized by the SCV NPS Control Program as a wet basin.

Pump Station No. 2. This pump station lifts storm water from 700 acres of a low lying area in northeast Sunnyvale and discharges directly to Calabazas Creek. Since the pump station was originally designed such that storm water flows directly to the pump station without being detained (unless the capacity of the pumps is exceeded), this pump station had been characterized as a dry basin by the SCV NPS Control Program. In December 1990, the SCV NPS Control Program retrofitted Pump Station No. 2 to promote settling of particles in order to maximize removal of pollutants prior to discharge to Calabazas Creek. Prior to pumping, the entire basin is covered with water and acts as a wet basin during the wet weather season. When the water level is approximately two feet deep near the outlet structure, the pumps are activated;

the pumps are inactivated when the water level drops to approximately one foot. This allows pollutants to settle before being discharged to the bay.

Potential Pump Station No. 3. Excessive groundwater pumping for 50 years from 1916 - 1966 has caused the northern half of the City to subside (see the section Ground Subsidence and Rise in Sea Level). However, subsidence is no longer rapidly occurring due to improved management of aquifers. According to the revised Master Plan, should subsidence occur to the degree that runoff can no longer discharge to the Bay by gravity, the City would need to construct a third pump station along the west bank of Calabazas Creek, just north of Lakewood Village.

Discharge of Surface Runoff

San Francisco Bay

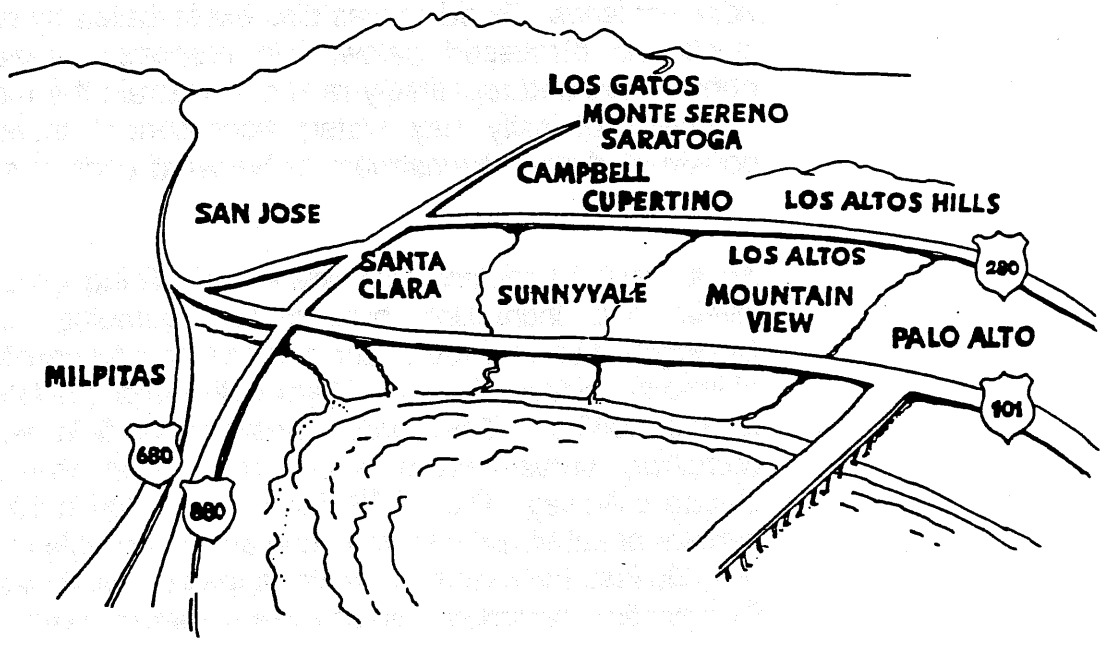
Surface runoff from the City of Sunnyvale generally discharges to channels maintained by the SCVWD which leads to San Francisco Bay. In February 1989, this area was included on the list of impaired waters in the State of California for the following metals: cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc. Nonpoint sources mostly from urbanized areas contribute significant amounts of chromium, copper, lead, nickel, zinc and suspended solids to San Francisco Bay. The SCV NPS Control Program's Annual report for Fiscal Year 1991-92 indicates that some of the metals associated with urban runoff may pose potential water quality problems.

In April 1991 the State Board adopted the "California Inland Surface Waters Plan" and the California Enclosed Bays and Estuaries Plan." These Plans contain numeric water quality objectives for metals and other priority pollutants for water bodies throughout California. The Regional Board incorporated numeric water quality objectives from these Plans into an amended "Water Quality Control Plan" for the San Francisco Bay Region in September 1992. However, in October 1992 the Regional Board adopted a site-specific numeric water quality objective for copper for the San

Francisco Bay Region. The Regional Board is also developing a mass emissions strategy for selenium which they believe will better protect beneficial uses from excessive bioaccumulation of selenium through the food chain. To accomplish this, the Regional Board is considering adopting a set of ecological assessment guidelines and a general plan to be implemented over the next ten years. The Regional Board may also adopt a site-specific objective and/or mass emission strategy for mercury, another bioaccumulative element.

Infiltration to Groundwater

The areawide municipal storm water NPDES permit requires the SCV NPS Control Program to develop an infiltration policy for Santa Clara Valley. The benefits of controlling pollutants in urban runoff using infiltration methods must be balanced against the potential for degrading the beneficial uses of groundwater. The 1992 Basin Plan Amendments include the following objectives for a shallow drainage well control program: 1) locate existing wells and 2) regulate existing and new wells in areas where the beneficial uses of the groundwater may be threatened. These objectives are to be attained through a coordinated effort among the U.S. EPA, California's Department of Water Resources, the Regional Board, and local government agencies.



Ground Subsidence and Rise in Sea Level

Ground subsidence and rise in sea level resulted in flooding of areas near San Francisco Bay in the early and mid 1900s. Levees have been constructed near the baylands and along the downstream reaches of streams to control flooding problems, and aquifers are now managed to control subsidence. The causes of ground subsidence in the past and impact of rise in sea levels on the City are described in this section.

Ground Subsidence

Due to excessive ground water pumping for irrigated agriculture, and subsequently for urban and industrial development, land surface levels declined as much as 12.7 feet in Santa Clara Valley from 1916 to 1966. Maximum subsidence occurred in the central one-third of the valley in San Jose and Sunnyvale with average subsidence in Sunnyvale ranging from 6 to 8 feet during this time period.

Subsidence is caused by the removal of interstitial water from compressible fined-grained materials resulting in irreversible compaction of the soil structure. Subsidence in Santa Clara Valley resulted in breakage of hundreds of water well casings and the southern portion of San Francisco Bay flooding adjacent lands. Flooding was also exacerbated by rising sea levels, as discussed below. In response, levees were constructed and repeatedly raised to restrain the movement landward of salty bay water; flood-control levees were constructed near downstream or bayward ends of streams.

As a result of regional subsidence, declining groundwater levels, and increasing groundwater pumping, the U.S. Geological Survey (USGS) conducted a comprehensive study of land subsidence in Santa Clara Valley from the late 1950's to the 1980's. The study consisted of field work and compiling survey (subsidence) data from the National Geodetic Survey. The USGS drilled core holes in 1960 at the centers of subsidence in San Jose and Sunnyvale to a depth of 1,000 feet, the maximum depth tapped by most water wells. Compaction recorders, called extensometers, were installed

in the 1,000 feet core holes in order to measure the compaction or expansion of sediments as compared with changes in groundwater levels and subsidence. Data were collected for 22 years, from 1960 until 1982 when USGS terminated measurements of groundwater levels and compaction or expansion.

Recovery of groundwater levels primarily due to the availability of surface water imports to Santa Clara County for direct use and recharge of aquifers has resulted in minimal subsidence since 1967. However, because of the current drought, the SCVWD recently resumed compaction, groundwater level, and land surface measurements.

Rise in Sea Levels

Changes in global sea levels due to climatic fluctuations have occurred throughout geologic time. During ice ages, glaciers expand and sea levels decrease; during periods of warmth, glaciers shrink and sea levels rise. Although changes in sea level have been gradual and constant over the past 5,000 years, the rate of sea level rise of 0.0039 feet per year during the past 100 years has almost doubled to 0.0072 feet per year during the past 19 years. The cause of the increase in the rate of sea level rise may be due in part to the greenhouse effect (the emission of gases, especially carbon dioxide, methane, and chlorofluorocarbons, that increase the earth's air temperature by several degrees).

A study conducted by the San Francisco Bay Conservation and Development Commission (BCDC) in 1988 concludes that sea levels may rise 1.7 inches in the next 20 years and 4.32 inches in the next 50 years due to global warming alone. Furthermore, any changes in land elevation due to subsidence would worsen the effects of rising sea levels.

Rise in sea levels could cause significant problems in the future: flooding, shoreline erosion, and saltwater intrusion into fresh water streams and aquifers. Although subsidence is now controlled by groundwater recharge and management of pumped aquifers, it may not be feasible to control the effects of global warming on rising sea levels.

Erosion and Sedimentation Control

Erosion may be exacerbated by construction activities that disturb land surfaces. Such activities may include the reduction or removal of vegetation, excavations, or topography alterations to reshape the land for construction or development purposes. These activities expose disturbed soils to precipitation and to storm water runoff. Properly managed, however, such activities need not lead to deposition of sediment in watercourses.

This section first describes the existing nonpoint source pollution control program coordinated with the SCV NPS Control Program. The subsequent sections then compare the existing erosion and sedimentation control measures with the following regulatory programs:

1. Compliance with the Regional Water Quality Control Board's Erosion and Sedimentation Control Program requirements, and

2. EPA's November 1990 storm water regulations regarding construction sites activities.

Existing Control Measures

Because the City is mostly flat, there is typically little potential for sediment and debris transport to the storm drain system from construction sites. However, where specific site conditions, such as an excavation or a stock pile of excavated material, may create erosion and sedimentation, Department of Public Works staff advises the project site engineer to include guidelines for erosion and sediment control in the project plan. Examples of these types of projects the Department of Public Works is involved in include improvements to public right-of-way (such as curbs and street) and public utilities (such as storm drain lines and inlets). If guidelines are included in the project plan, they are referenced from the Manual of Standards for Erosion & Sediment Control Measures, developed by the Association of Bay Area Government (ABAG), 1981. This manual was prepared to provide guidance to San Francisco Bay Area cities and counties to control water quality impacts from

construction-related activities. The Building Department also enforces construction and grading procedures specified by the Uniform Building Code.

Additional controls may be administered by the Director of Public Works and the Director of Community Development who can halt construction if related activities create a nuisance or hazard. Construction will not be allowed to continue until adequate control measures have been implemented.

To date, the City is approximately 97% built out and there are no large adjacent land areas for possible annexation except possibly Moffett Field. (In the interior of the City, approximately 40 acres of agricultural land could also be developed). Due to the limited potential for further development, the City has not needed to formulate city specific erosion and sedimentation controls for constructions sites. Nonetheless, BMPs are described in the Joint Santa Clara Valley and Alameda County Storm Water Quality Controls for New Development in Santa Clara Valley and Alameda County: A Guide for Controlling Post-Development Runoff and will be required to be implemented, as appropriate.

Compliance with the Regional Board's Erosion and Sedimentation Control Program Requirements

The Regional Board staff approved Sunnyvale's erosion and sediment control program in a letter to the Building Inspection Superintendent dated May 3, 1983. The Regional Board staff letter of approval includes the following review based on information provided by the City:

> ". . . potential for erosion and sedimentation from construction sites is low since the remaining 320 acres of developable land within the city limits is mostly flat (<10% slope), and development will consist primarily of industrial lots and infilling of single lots, and there is no available annexable land. Additionally . . . erosion should be minimal since the City indicates that the small amount of grading is

> usually accomplished in one dry season and projects are unlikely to begin during the November to mid-February rainy season. Furthermore, . . . minimum erosion and storm drainage control measures and practices are typically contained within grading permits in accordance with the Uniform Building Code-Chapter 70 and the City's Resolution No. 193-76 and that city inspectors routinely check for compliance with these items."

The City has adopted the Uniform Building Code as part of its Municipal Code including Chapter 70 which describes measures to regulate grading, filling, and excavation.

Resolution No.193-76 specifically deals with the "improvement standards . . . with providing and maintaining . . . surface drainage and outside storage areas. . . ." Surface drainage provisions focus on requirements to facilitate storm water run-off to storm drains.

Since approval by Regional Board staff, there have been no significant changes in development. There are small pockets of remaining unincorporated land that may be annexed in the future. For example, there are approximately thirty acres of orchards south of El Camino Real that may be proposed for annexation as a residential development. Annexation will be considered upon request of the property owner.

Conformance with EPA Storm Water Regulations Regarding Construction Sites

EPA's storm water regulations, promulgated in November 1990, contain the following requirements regarding erosion and sedimentation control:

> ". . . a description of a program to implement and maintain structural and non-structural best management practices to reduce pollutants in storm water run-off from construction sites to the municipal storm sewer system, which include:

(1) a description of procedures for site planning which incorporate consideration of potential water quality impacts;

(2) a description of requirements for nonstructural and structural best management practices (BMPs);

(3) a description of procedures for identifying priorities for inspection sites and enforcing control measures which consider the nature of the construction activity, topography, and characteristics of soils and receiving water quality; and

(4) a description of appropriate educational and training measures for construction site operators."

For the City of Sunnyvale, regulation begins with review of a grading plan needed prior to completing a grading permit application. Because not all problems can be anticipated during the planning stage, ABAG's recommended erosion and sediment controls should be included as requirements in grading permits. If a site does not require grading, ABAG's guidelines should be included as requirements in general building permits. By following these procedures, EPA's first requirement is met.

The second requirement listed above is satisfied by the BMPs described in Storm Water Quality Controls for New Development in Santa Clara Valley and Alameda County: A Guide for Controlling Post-Development Runoff. The manual describes BMPs which reduce pollutants discharged during activities related to new development and redevelopment.

The third requirement of the EPA's storm water regulations suggests that the City establish which departments are to be involved in site plan reviews, inspections, and enforcement. This part of the EPA regulations also requires the City to determine how responsible departments go about reviewing site plans, conducting inspections, and pursuing enforcement to control non-storm water discharges to storm drains. Responsibilities for reviewing site plans and conducting inspections in the City of Sunnyvale are shared by two departments: the Building division of the City's Community Development Department which is responsible for

construction activities on private property, and the Public Works Department which is responsible when construction activities involve public property (streets, utilities and/or the storm drain system). Because storm drains on private property will eventually discharge into the public storm drain system, the Public Works Department will have an active interest in such developments. Inspection and enforcement procedures should be formalized by the City, and each inspector monitors construction activities based on specific site conditions.

The fourth requirement of the Federal Storm Water Regulations requires that the City provide educational and training opportunities for construction site workers. The City's compliance with this portion of the regulations is provided by its involvement with the SCV NPS Control Program through the Public Information/Participation (PI/P) Program as documented in the SCV NPS Control Program's Stormwater Management Plan (January, 1991). The PI/P Program provides education concerning nonpoint source pollution impacts and proper construction, agricultural practices, erosion control, and land management. By late 1991, the City had commenced a program of stenciling the message "No Dumping, Flows to Bay" on all storm drain inlets. Additionally, the City is enclosing informational flyers with utility bills. As of May 1992, 1,129 stencils had been applied within the City and it is expected that all storm drain inlets will be stencilled in the near future.

Pollution from Non-Point Sources

The following reviews the City of Sunnyvale's surface runoff water and sediment quality data provided by the SCV NPS Control Program and identifies potential water quality problem areas.

Surface Runoff Water and Sediment Quality

Water Quality

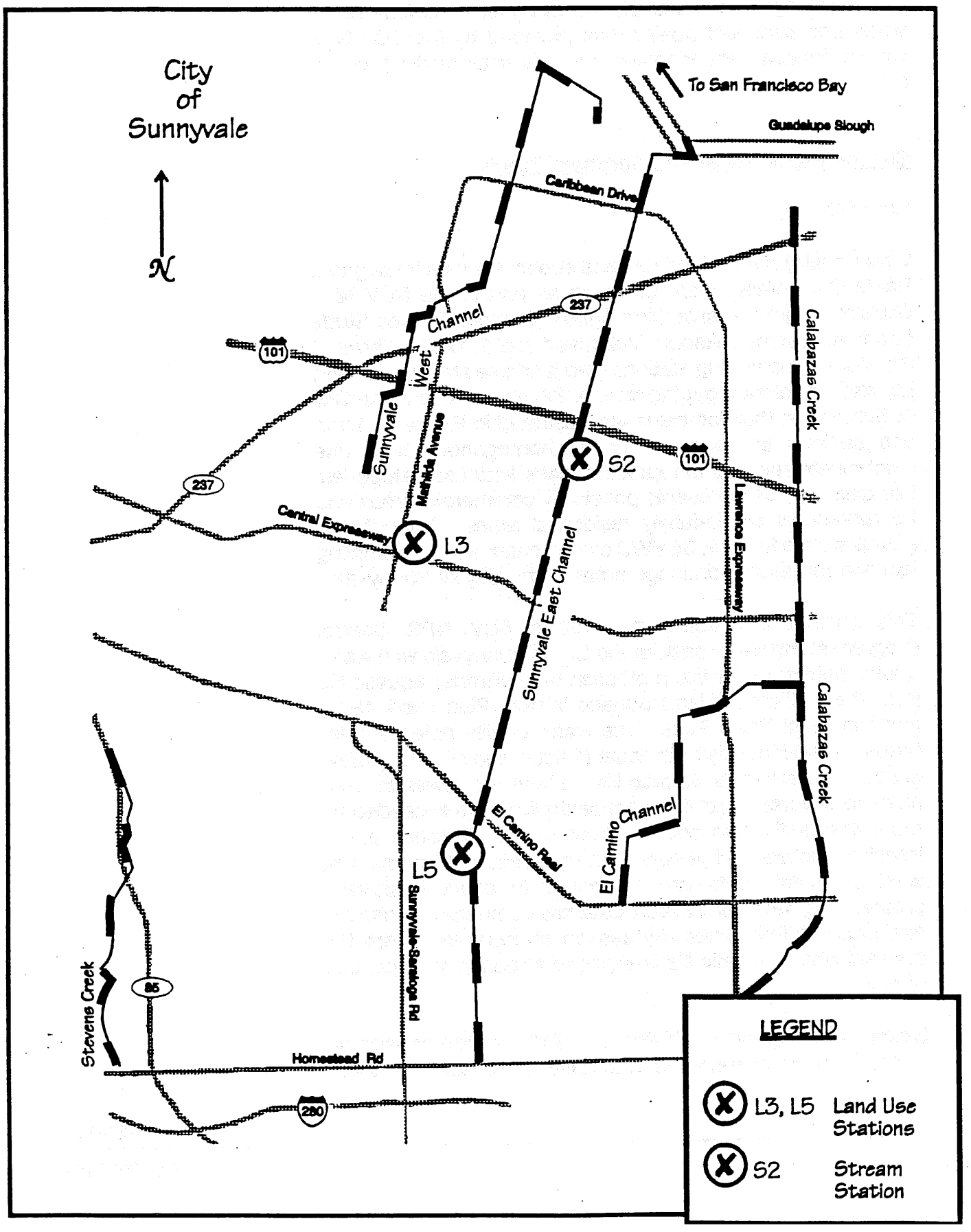
Water quality data at land use and stream stations throughout Santa Clara Valley were compiled as part of the SCV NPS Control Program (Santa Clara Valley Nonpoint Source Study Loads Assessment Report, Volumes 1 and 2, 1989). Three of the study's monitoring stations (two land use stations, L3 and L5, and one stream gaging station, S2) are located in the City of Sunnyvale; their locations are illustrated in Figure 4. Land use stations are small, relatively homogenous land use catchments selected to represent major land use categories. For example, L3 represents principally commercial areas and L5 represents single-family residential areas. Though the samples were taken in SCVWD owned channels, the sampling location represents drainage areas in the City of Sunnyvale.

This section first compares existing SCV NPS Control Program storm water data for the City of Sunnyvale with water quality objectives for the protection of freshwater aquatic life from the California Inland Surface Waters Plan (April 1991) and the 1992 Basin Plan. The water quality objectives for heavy metals includes both acute (1 hour) and chronic (4 day) effects on freshwater aquatic life. These are levels that will have no adverse effect if the concentrations are exceeded no more frequently than once in three years. Because of the transitory nature and generally short duration of storms, wet weather metals data are compared to acute freshwater criteria. Dry weather season data are compared to chronic freshwater criteria since dry season concentrations are the concentrations aquatic life is exposed to during long periods of time.

Since sampling was initiated in 1988, a comparison of concentrations of elements in surface runoff samples taken

FIGURE 4

LAND USE AND STREAM GAGE MONITORING STATION LOCATIONS



from Sunnyvale (station S2) and water quality objectives has shown the following:

1. During the wet season, copper, lead and zinc concentrations from Sunnyvale surface runoff samples exceeded water quality objectives in more than half of the samples.

2. During the dry season, one of the selenium concentrations (of eight) exceeded water quality objectives.

To describe the potential water quality impacts of nonpoint source runoff on the Lower South San Francisco Bay, City storm water data are also compared with data from monitoring station C-5-0 established by the WPCP for the Regional Board located in the South Bay (Figure 5). It is extremely important, however, when making a water quality comparison, to keep in mind the different natural processes that may occur before the storm water discharges into the Bay. For example, pollutants in storm waters will be diluted by tidal water and other natural runoff, and may be attenuated, and/or change chemical compositions prior to reaching the Bay. Although a cause and effect relationship between City surface run-off and the Bay has not been demonstrated, a comparison is made to provide a frame of reference as to the possible impacts surface run-off may have on the water quality of the South Bay.

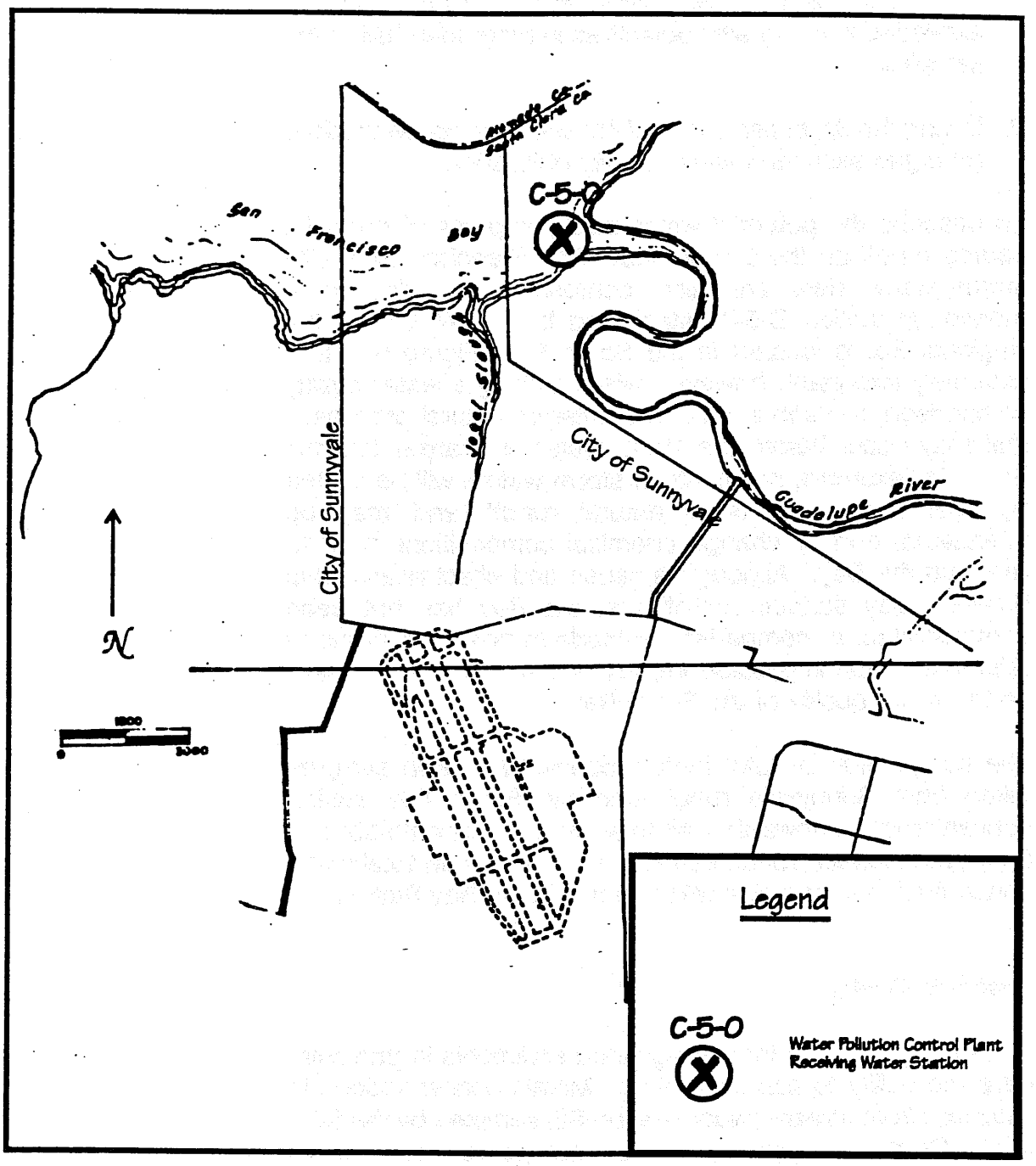
The comparison of total metals concentrations in samples taken from Sunnyvale runoff and the South Bay station concentrations shows that all total metals concentrations in Sunnyvale surface runoff samples were less than total metal concentration in samples taken at the South Bay Station.

Sediment Quality

Studies have shown that fine-grained sediments in particular have the ability to adsorb metals. Metals concentrations in sediment from stream gauge station S2, sampled by the SCV NPS Control Program, were compared to metals concentrations in sediment from the South San Francisco Bay Station. As with the water quality comparison, sediment in surface runoff may not be transported to the South San

FIGURE 5

SOUTH SAN FRANCISCO BAY MONITORING STATION LOCATION



Francisco Bay Station, but a comparison is made to provide a frame of reference concerning the possible impacts of sediment in runoff on the sediment quality of the South San Francisco Bay. The comparison shows that total metals concentrations in sediment samples taken from within the City were all less than total metals concentration in sediment samples from the South Bay station.

Focused Pollution Prevention Activities

Federal regulations, incorporated into the SCV NPS Control Program's areawide municipal storm water NPDES permit, require that the City: 1)institute controls to reduce the discharge of pollutants to the storm drain system owned and operated by the City to the maximum extent practicable; and 2) effectively prohibit non-storm water discharges into the storm drains. This section describes pollution prevention controls which focus on certain activities.

Industrial Activities

The SCV NPS Control Program Loads Assessment study concluded that the concentrations of cadmium, chromium, lead, and zinc tended to be two to three times higher in industrial areas than in commercial and residential areas. To control pollutants in storm water from industrial facilities, EPA's 1990 storm water regulations require industries to obtain NPDES permit coverage for storm water discharge.

Approximately 85% of the area north of the Central Expressway has been zoned for industrial uses. In coordination with the SCV NPS Control Program, WPCP staff will perform the necessary industrial inspections. The WPCP staff has already initiated the industrial inspection program through its pretreatment program by requiring industries to prepare waste minimization audits which include controlling discharges to storm drains.

Illegal Dumping and Illicit Connections

Illegal dumping is the intentional disposal of solid and liquid wastes into storm drains, open channels, and other waterways. Illicit connections are cross-connections which result in the discharge of industrial or sanitary wastes into the storm drain system. Illicit connections are structural features that the City eliminates once identified. Illegal dumpings, however, are occurrences that require continued monitoring and inspection.

As part of the SCV NPS Control Program, the City is developing and implementing a field program to investigate and eliminate dumping of pollutants into storm drains and drainage channels. If spill incidents are reported, the Hazardous Materials Response Team blocks off the area to contain the spill and covers any nearby storm drain inlets to prevent release to surface waters. To identify potential areas for illegal dumping in the City, a map of spill incidents reported between May 1989 and April 1991 and compiled for the Proposition 65 program (73 total) is illustrated in Figure 6.

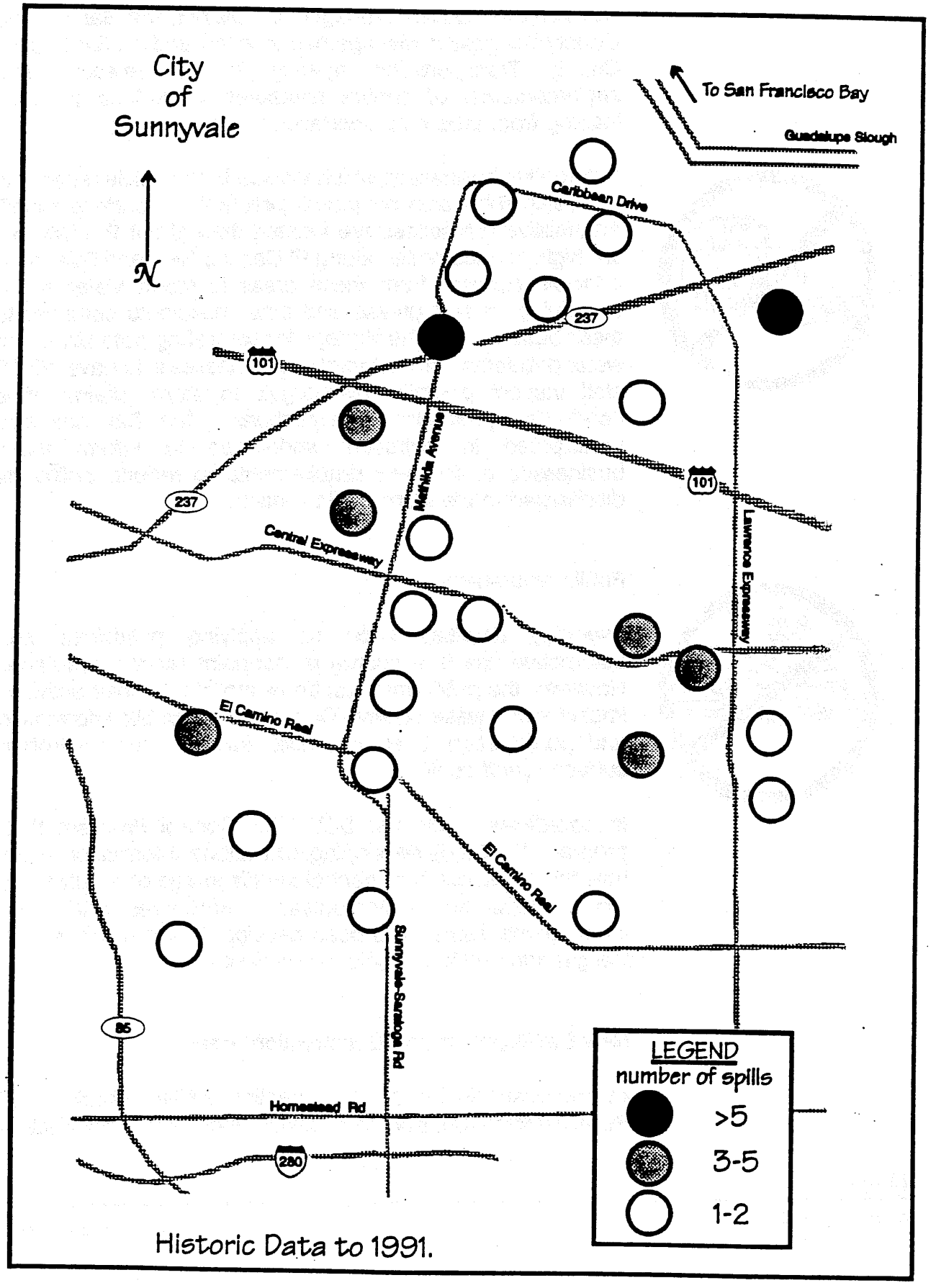
The SCV NPS Control Program states that the City will develop and implement an aggressive field program to search for, detect, and control illicit connections between storm drains and sewers which carry sanitary and/or process wastewater. It has been the City's policy to eliminate illicit connections as soon as they are discovered. The City also conducts dye tests to locate possible illicit connections.

Pollutants from Automobiles

Automobile usage contributes to nonpoint source pollution in several ways. For example, automobile use requires paved roads which prevent infiltration of rain water and increase storm water runoff. Vehicular traffic releases pollutants through air emissions, leaks, tire wear, etc. Because of the potential release of pollutants from automobile usage, the areawide municipal storm water NPDES permit requires an Urban Transportation Corridor Nonpoint Source Load Characterization. A plan to "characterize pollutant loadings from major highways and road surfaces" was submitted to the Regional Board in August 1991. The 1992 addendum to the

FIGURE 6

PROPOSITION 65 SPILLS LOCATION



SCV NPS Control Program's areawide municipal storm water NPDES permit also requires the City to participate with the Bay Area Air Quality Management District, the Santa Clara County Congestion Management Agency, and the Santa Clara County Transportation Agency in the selection and implementation of control measures to reduce pollutant loading from urban transportation to storm water.

Automotive businesses which include both vehicle repair and car dealerships also contribute pollutants to surface runoff. Automotive businesses are located throughout the City but are highly concentrated along El Camino Real and Evelyn. A principle concern from these areas is storm water runoff containing oil and grease and other pollutants common to these businesses. The strategy for controlling potential storm water pollutants from automotive businesses is to have WPCP staff inspect potential discharges to storm drains while conducting pretreatment inspections. The City has also participated in outreach workshops to inform these businesses of the new requirements to reduce pollutants discharged to the storm drain system.

Public Awareness

Everyday activities such as applying pesticides and automotive use is a source of nonpoint source pollutants. However, the public may not be aware of how their activities impact storm water quality. Consequently, public information and participation is an essential element for controlling surface runoff quality.

In coordination with the SCV NPS Control Program PI/P program, the City is developing educational information about how the public can help control the discharge of pollutants to storm drains and watercourses. Brochures and other informational items have been developed and distributed to the general public, schools, and industries.

New Development and Construction Areas

As discussed in the previous section entitled Erosion and Sedimentation Control, new development and construction

areas in general can be a source of pollutants to storm drains both during and after construction. For a discussion on new development and construction control measures, see the section Erosion and Sedimentation Control.

Funding

When funding for the SCV NPS Control Program was initiated in Fiscal Year 1987-88, costs were approximately $50,000 for the City of Sunnyvale for monitoring and analysis. Since full implementation of the Program in 1990, costs have increased to approximately $250,000 annually for the City. Total Program expenditures for all municipalities and all tasks (areawide and municipality-specific) were estimated at $3.1 million in FY 1990-91, and $3.9 million in FY 1991-92.

Since 1990 the costs for areawide tasks (tasks which benefit all municipalities) are generally $2 million. The City of Sunnyvale's proportional share of areawide costs is 7.25% (based on the SCVWD's Benefit Assessment Revenue Program) which amounts to approximately $143,550. The City of Sunnyvale has committed a similar amount of funding for City specific activities such as stencilling (labelling) storm drain inlets, school programs, and educational workshops for industries. Currently, funding is provided through sanitary sewerage revenues.

TABLE 2

COMMUNITY CONDITION INDICATORS

	FY 88/89	FY 89/90	FY 90/91	FY 91/92
1. Rain Gage Stations (Station locations illustrated in Figure 7) Annual Rainfall (inches)				
SCVWD Station No.48	6.90	9.20	8.98	16.70
Sunnyvale Station No.83	9.39	10.95	9.44	14.22
2. Maintenance Activities				
Number of Storm Drain Inlets Cleaned (total number of storm drain inlets in Sunnyvale = 3200):	3,848	3,475	2,977	3,050
Preventive Maintenance In Response to Complaints	309	498	343	314
Streets Swept (curb miles; total curb miles in Sunnyvale = 569)	14,545	14,756	14,832	14,917

FIGURE 7

RAIN GAGE STATIONS FOR COMMUNITY CONDITION INDICATORS